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EXAMINER	
MONDT, JOHANNES P	
ART UNIT	**PAPER NUMBER**
2826	

DATE MAILED: 06/28/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Applicati n N .	Applicant(s)	
	09/667,775	KAWANISHI ET AL.	
	Examiner	**Art Unit**	
	Johannes P Mondt	2826	

-- The MAILING DATE f this communication appears on the c ver sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *16 April 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-9 and 11-54* is/are pending in the application.

4a) Of the above claim(s) *21-54* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,4-9 and 11-20* is/are rejected.

7)☐ Claim(s) *2 and 3* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *16 April 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

Amendment filed 04/16/2004 forms the basis of this Office Action. In said Amendment Applicant amended claims 3, 6, 15, 17, 18 and 20.

Comments on Remarks in said Amendment are included below under "Response to Arguments".

Response to Arguments

1. Applicant's arguments filed 04/16/2004 have been fully considered but they are not persuasive. In particular, although

(a) the objection to claim 6 is withdrawn in view of the amendment,

(b) the objection to the Drawings is herewith withdrawn in view of Applicant's labeling and explanation,

(c) the rejections under 35 USC §112, first paragraph, of claims 18 and 19 are herewith withdrawn in view of the amendment to claim 18 (for disclosure of the claimed subject matter see page 11 of the Specification),

(d) the rejections under 35 USC §112, second paragraph, of claims 15, 17 and 20 are herewith withdrawn in view of the amendments to claims 15, 17 and 20.

However, the following art rejections under 35 USC § 102 and § 103 must be made to stand:

(1) With regard to the rejection under 35 USC § 102(b) of claim 1 as being anticipated by Tanaka (5,177,753):

According to Applicant's own admission (page 18 of Remarks, first sentence of final paragraph) "the laser chip in Tanaka is encapsulated with three different components of different materials", which as had also been pointed out in the previous action, according to Applicant are the "transparent resin material 15" (line 3 from below on page 18), the "material of the waveguide member 18" (line 7 of page 19 of Remarks), - said waveguide member 18 also being a resin: see column 3, lines 48-52 as previously cited; and the "protective seal resin material 20" (line 8 of page 19 of Remarks); from which it follows that the prior art as cited (Figure 5 in Tanaka) meets the following limitations upon identification of the resin 15/18/20 as corresponding to the claimed resin: "wherein the resin comprises two or more materials" and "wherein the semiconductor laser chip is encapsulated within the resin".

Furthermore, the cited portion of column 4, lines 59-66 for the waveguide member resin 18 teaches the mixing into 18 of a "light scattering agent such as Al_2O_3, titanium oxide or the like", which leads to light scattering (see column 4, the same cited portion of liens 59-66) and hence to an inhomogeneous refractive index, because light scatters at any interface if and only if the refractive index is discontinuous at said interface. Because Al_2O_3 is neither a thermo-setting resin nor a silicon resin, - and neither is titanium oxide (see column 3, lines 48-52 as cited previously) it follows that, counter to Applicant's allegation on the final line of page 18 and the first line of page 19 of Remarks, the claimed resin 15/18/20 does "comprise two or more materials of different refractive indexes".

Also, said resin 15/18/20 has a light diffusion capability for at least two independently valid reasons: (I) all matter scatters light, and hence said light diffusion capability is inherent to the (mass containing) resin 15/18/20 (see page 4 of the previous office action for a previous explanation of this point offered by the examiner); and (II) the inclusion of two substances of different refractive indexes: the inclusion of light scatterers (Al_2O_3 or titanium oxide or the like) enhances light diffusion through scattering. Therefore, Tanaka meets the limitation "a resin having a light diffusion capability".

Because said limitation is squarely met, Applicant's argument that "Tanaka teaches away from a resin having a light diffusion capability" is not valid. It is thus maintained that Tanaka does meet the limitation that resin 15/18/20 has "a light diffusion capability".

Furthermore, Applicant's argument that resin portion "20 is not for purposes of transmitting light" (page 19, final sentence of first paragraph) is irrelevant, because "for purposes of" is functional language and as such irrelevant to the device as claimed, while said argument also admits 20 to be an additional scatterer, because light either is transmitted through 20 or is scattered on its surface. With regard to Applicant's statements that the "former section pertains to the transparent resin material 15 covering the front cleavage face 5a" and that the "later section at column 4 pertains only to the material of the waveguide member 18 connecting the rear cleavage face 5b", this traverse in no way address specific shortcomings in Tanaka's ability to meet the claimed invention. Parenthetically, both through 5a and through 5b light is emitted.

Similarly, Applicant's argument that Tanaka teaches away from "forming a molded lens" is irrelevant in view of the rejection under 35 USC 102, in particular it is contradicted by the teaching of a curved face of the molded resin member (see column 5, lines 3-12 as previously cited). In conclusion, Tanaka meets the limitation "forming a molded lens".

Finally, the laser light is indeed "emitted through said molded lens" because said molded lens is located at the very interface between the semiconductor laser chip and the transparent resin portion 15 (see also column 3, lines 60-65).

In overall conclusion, Tanaka meets all limitations of claim 1.

(2) With regard to the rejections under 35 USC § 103(a) of claim 4 and dependent claims as being unpatentable over Tanaka in view of Thornton et al, the traverse of the rejection of claims 17 and 20 is moot in view of the substantial amendment of claims 17 and 20, while the arguments in the first full paragraph on page 21 have already been addressed in detail above in the discussion of the traverse of the rejection of claim 1. Applicant's argument that the "three components (of the resin) do not collectively form a lens" (second paragraph of page 21) does not address the claim language at hand. With regard to the traverse in the third paragraph of page 21, again the resin identified with the claimed resin is resin 15/18/20. As stated and explained above, because the limitation is squarely met, Applicant's argument that "Tanaka teaches away from a resin having a light diffusion capability" is not valid. It is thus maintained that Tanaka does meet the limitation that resin 15/18/20 has "a light diffusion capability". Similarly, Applicant's argument that Tanaka teaches away from

"forming a molded lens" is irrelevant in view of the rejection under 35 USC 102, in particular it is contradicted by the teaching of a curved face of the molded resin member (see column 5, lines 3-12 as previously cited). In conclusion, Tanaka meets the limitation "forming a molded lens". Thornton et al is only cited for the motivation to include a plurality of light emitting portions for the purpose of providing multi-color capability, which is independent upon the specific kind of semiconductor laser chip, the interior details of the semiconductor laser chip being independent upon the invention by Tanaka aimed at improving protection of said semiconductor laser chip. Therefore, Applicant's arguments in the second paragraph of page 22 based on differences in the laser unit are irrelevant. With regard to the arguments by Applicant starting at the final (partial) paragraph of page 22, not Applicant's motivation but instead Thornton's is pertinent to the issue whether sufficient motivation exists.

In conclusion, the rejection of claim 4 and currently dependent claims 7 and 16 must be made to stand.

(3) With regard to the rejections under 35 USC § 103(a) of claims 4 and 7 as being unpatentable over Tanaka in view of Claisse et al, counter to Applicant's argument that Claisse et al does not make up for the deficiencies in Tanaka et al with regard to the teachings of the independent claim 1, Applicant is referred to the discussion of claim 1 above. Because the efficiency of any laser can be greatly improved through the use of multiple quantum wells, with reference to the discussion in the previous office action, motivation to include the teaching by Claisse et al in the

invention by Tanaka et al simply is the increased efficiency, which is a ubiquitous advantage for lasers of any kind. Therefore, these rejections must be made to stand.

(4) With regard to the rejections under 35 USC § 103(a) of claims 5 and 8 and dependent claims as being unpatentable over Tanaka in view of Hirayama et al, Applicant's arguments in traverse on pages 24-26 until the final paragraph of page 26 depend wholly on Applicant's arguments in traverse of those limitations shown to be taught by Tanaka et al (see discussion of claim 1, which is, except for the range limitation on the width of at least one light emitting portion, broader than claim 1. Applicant is referred in this regard to the discussion of Applicant's arguments of traverse of the rejection under 35 USC § 102 of claim 1. With regard to Applicant's arguments in traverse of obviousness of the limitation "wherein the semiconductor laser chip includes at least one light emitting portion having a width of about 7 μm or more" in view of Hirayama et al, said arguments appear to be based on the purpose of Applicant's invention, namely "for purposes of safety to human vision", not Tanaka's, and hence are moot. Therefore, the rejection of claims 5 and 8 as being unpatentable over Tanaka in view of Hirayama et al must be made to stand.

(5) With regard to the rejections under 35 USC § 103(a) of claims 6 and 9 as being unpatentable over Tanaka in view of Andrews, Applicant's arguments in traverse only traverse the rejection of the independent claim 1, for which Applicant is referred to the discussion above of the rejection under 35 USC §102 of claim 1. Therefore, the rejections have to be made to stand.

(6) With regard to the rejections under 35 USC § 103(a) of claim 11 as being unpatentable over Tanaka in view of Okuda, claims 12 and 13 as being unpatentable over Tanaka in view of Andrews, Brooks et al or, in the alternative, Missaglia, and of claims 14 and 15 as being unpatentable over Tanaka et al and Claisse et al as applied to claim 4, and further in view of Hazell et al, Applicant presented no arguments in traverse other than those directed to the rejection of the independent claim 1 and already addressed above. Therefore, said rejections must be made to stand.

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. ***Claim 1*** is rejected under 35 U.S.C. 102(b) as being anticipated by Tanaka (5,177,753). Tanaka teaches a semiconductor laser device (cf. title, abstract, Figure 6, col. 2, l. 28 – col. 3, l. 44, and col. 4, l. 15-40) including: a semiconductor laser chip 5 (cf. col. 2, l. 50); and a resin 15/18/20 (cf. col. 3, l. 15-18 for element 15, col. 3, l. 48-52 and col. 4, l. 59-66 for element 18, and col. 4, l. 44 for element 20) having a light diffusion capability by virtue of its constitution (cf. col. 3, l. 19-23) (quite apart from the at least two – component mixture that is comprised in said resin it is argued by the examiner that "a light diffusion capability" is inherent to any massive substance unless specifically quantified further because light scatters off matter, thus performing a

random walk through the medium, which is the microscopic cause of the phenomenon of diffusion), wherein the resin comprises two or more materials of different refractive indices (cf. col. 3, l. 19-23 and col. 4, l. 59-66), and wherein the semiconductor laser chip is encapsulated within the resin 15/18/20 forming a molded lens, namely through a curved face of the resin member (cf. col. 5, l. 3-12). In conclusion, Tanaka anticipates claim 1.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. ***Claims 4, 7 and 16*** are rejected under 35 U.S.C. 103(a) as being unpatentable over Tanaka (5,177,753) in view of Thornton et al (5,386,428) (previously made of record).

On claim 4: Tanaka teaches a semiconductor laser device (cf. title, abstract, Figure 6, col. 2, l. 28 – col. 3, l. 44, and col. 4, l. 15-40) including: a semiconductor laser chip 5 (cf. col. 2, l. 50) encapsulated within resin 15/18/20 (cf. col. 3, l. 15-18 for element 15, col. 3, l. 48-52 and col. 4, l. 59-66 for element 18, and col. 4, l. 44 for element 20) having a light diffusion capability by virtue of its constitution (cf. col. 3, l. 19-23) (quite apart from the at least two – component mixture that is comprised in said resin it is argued by the examiner that "a light diffusion capability" is inherent to any massive substance unless specifically quantified further) and forming a molded lens (namely

through a curved face of the resin member (cf. col. 5, l. 3-12) of the molded resin 15; cf. col. 3, l. 19-44).

Tanaka does not necessarily teach the further limitation that the semiconductor laser chip includes a plurality of light emitting portions, although said semiconductor laser chip includes at least one light emitting portion inherently.

However, it would have been obvious to include said further limitation in view of Thornton et al, who teach a plurality of light emitting portions (a first portion centered around region 16 and a second portion centered around region 40; cf. col. Figure 1 and col. 4, l. 38 – col. 5, l. 21) in a semiconductor laser chip (formed on single substrate 9; cf. col. 4, l. 19; see also title and abstract).

Motivation for inclusion of the teaching by Thornton et al in this regard in the invention by Tanaka derives from the advantage of having more than one color (cf. col. 1, l. 10-32). Combination of said teaching with said invention is straightforward because the interior details of the semiconductor laser chip are independent of the invention by Tanaka aimed at improving protection of said semiconductor laser chip.

<u>On claim 7:</u> the control that is the essence of claim 7 is inherent in the device of claim 4: spot size of an emitted light beam is inherently controllable by the size of the light-emitting portion in the semiconductor laser chip (because light is emitted over a larger or smaller area as a result of such adjustment) and the radiation angle of an emitted light beam is inherently controllable through the orientation of said light-emitting portion of the semiconductor laser chip (said orientation determines the direction of the emitting light, said direction being defined with respect to the internal coordinates of the

light-emitting portion); furthermore, given their lengths the light-emitting portion can be subjected to adjustment of the intervals between them so as to control the spot size, whereas an orientational adjustment of said interval also implies control of the radiation angle; furthermore, the number or plurality of said light emitting portions, again given their individual dimensions, controls the spot size while the size, material and shape of the molded resin determines the amount of diffusion to which the laser light is exposed after leaving the semiconductor chip, said diffusion determining the path of the photons through scattering, and thus the change in spot size, whilst the direction of the laser beam is determined by the index of refraction of said molded resin, hence on the material constitution of said molded resin. Therefore, the further limitation of claim 7 does not distinguish over the prior art.

On claim 16: the first (16) and second (40) light-emitting portions by Thornton et al emit light beams having different wavelengths λ_1 and λ_2, 780 nm and 850 nm, respectively (cf. Figure 1 and col. 4, l. 38-43 and col. 5, l. 6-10), which is both necessary and sufficient for the motivation of Thornton et al for having a plurality of light emitting portions, namely to have multi-color capability.

5. ***Claims 4 and 7*** are rejected under 35 U.S.C. 103(a) as being unpatentable over Tanaka (5,177,753) in view of Claisse et al (Electronics Letters Volume 28, No. 21 (1992)) (previously made of record and copy provided).

On claim 4: Tanaka teaches a semiconductor laser device (cf. title, abstract, Figure 6, col. 2, l. 28 – col. 3, l. 44, and col. 4, l. 15-40) including: a semiconductor laser

chip 5 (cf. col. 2, l. 50) encapsulated within resin 15/18/20 (cf. col. 3, l. 15-18 for element 15, col. 3, l. 48-52 and col. 4, l. 59-66 for element 18, and col. 4, l. 44 for element 20) having a light diffusion capability by virtue of its constitution (cf. col. 3, l. 19-23) (quite apart from the at least two – component mixture that is comprised in said resin it is argued by the examiner that "a light diffusion capability" is inherent to any massive substance unless specifically quantified further) and forming a molded lens (namely through a curved face of the resin member (cf. col. 5, l. 3-12) of the molded resin 15; cf. col. 3, l. 19-44).

Tanaka does not necessarily teach the further limitation that the semiconductor laser chip includes a plurality of light emitting portions, although said semiconductor laser chip includes at least one light emitting portion inherently.

However, it would have been obvious to include said further limitation because the use of multiple quantum wells rather than single quantum wells or bulk wells has long been known to offer the advantage of higher yield over single quantum wells and the advantage of manufacturability at significantly higher precision and perfection than all other structural embodiments of active regions in semiconductor laser chips, as evidenced for instance by Claisse et al; see Figure 2 for the internal quantum efficiency of single quantum wells and multiple quantum wells. Specifically be referred to the greatly improved internal quantum efficiency especially for laser lengths less than about 400 micron. Internal quantum efficiency is advantageous for any semiconductor laser chip.

Motivation to include the teaching by Claisse et al in this regard in the invention by Tanaka stems from the aforementioned increased quantum efficiency. The teaching by Claisse et al can be easily *combined* with the aforementioned invention, because any modification is limited to the active layer embodiment. Therefore, *success* in the implementation of the aforementioned combination can be *reasonably expected.*

On claim 7: the control that is the essence of claim 7 is inherent in the device of claim 4: spot size of an emitted light beam is inherently controllable by the size of the light-emitting portion in the semiconductor laser chip (because light is emitted over a larger or smaller area as a result of such adjustment) and the radiation angle of an emitted light beam is inherently controllable through the orientation of said light-emitting portion of the semiconductor laser chip (said orientation determines the direction of the emitting light, said direction being defined with respect to the internal coordinates of the light-emitting portion); furthermore, given their lengths the light-emitting portion can be subjected to adjustment of the intervals between them so as to control the spot size, whereas an orientational adjustment of said interval also implies control of the radiation angle; furthermore, the number or plurality of said light emitting portions, again given their individual dimensions, controls the spot size while the size, material and shape of the molded resin determines the amount of diffusion to which the laser light is exposed after leaving the semiconductor chip, said diffusion determining the path of the photons through scattering, and thus the change in spot size, whilst the direction of the laser beam is determined by the index of refraction of said molded resin, hence on the

material constitution of said molded resin. Therefore, the further limitation of claim 7 does not distinguish over the prior art.

6. ***Claims 5 and 8*** are rejected under 35 U.S.C. 103(a) as being unpatentable over Tanaka (5,177,753) in view of Hirayama et al (5,970,081) (previously made of record).

On claim 5: Tanaka teaches a semiconductor laser device (cf. title, abstract, Figure 6, col. 2, l. 28 – col. 3, l. 44, and col. 4, l. 15-40) including: a semiconductor laser chip 5 (cf. col. 2, l. 50) encapsulated within resin 15/18/20 (cf. col. 3, l. 15-18 for element 15, col. 3, l. 48-52 and col. 4, l. 59-66 for element 18, and col. 4, l. 44 for element 20) having a light diffusion capability by virtue of its constitution (cf. col. 3, l. 19-23) (quite apart from the at least two – component mixture that is comprised in said resin it is argued by the examiner that "a light diffusion capability" is inherent to any massive substance unless specifically quantified further) and forming a molded lens (namely through a curved face of the resin member (cf. col. 5, l. 3-12) of the molded resin 15; cf. col. 3, l. 19-44).

Tanaka does not necessarily teach the further limitation that the semiconductor laser chip includes at least one light emitting portion having a width of about 7 μm or more.

However, it would have been obvious to include said further limitation in view of Hirayama et al, who teach that, in the art of semiconductor laser devices a laser chip emitting light through a light-emitting portion with a width of 18 micrometer (cf. column 6,

lines 48-55), hence in the range claimed by Applicant, is standard in the art (see also Figure 2 in Hirayama et al).

Motivation to include the teaching in this regard by Hirayama et al in the invention by Tanaka is the advantage of added power in the laser beam, said advantage being achieved by having a wide light-emitting portion and also by reducing peak intensity within said laser beam as it traverses the molded resin that may inflict damage by thermal stress. *Combination* of said teaching with the inventions is easy, because inclusion of the teaching by Hirayama et al maximally only requires the replacement of the actual laser chip by the one taught by Hirayama et al and does not impact on any of the other aspects of the invention by Tanaka. *Success* in implementing said combination can therefore be reasonably expected.

On claim 8: the further limitation as defined by claim 8 is inherent in the device of claim 5: with reference to the discussion of claim 7 as given above and incorporated herein by reference, spot size and radiation angle can be controlled through adjustment of the width of the light-emitting portion irregardless of its width, and thus also for a width of said light-emitting portion of about 7 micron or more; and size, material, and dimension of the molded resin offers supplemental control through the scattering of the photons in said molded resin, whereby the spot size is increased whilst the direction of the light beam depends on the index of refraction, hence on the material constitution, of said molded resin. Therefore, the further limitation as defined by claim 8 does not distinguish over the prior art.

7. ***Claims 6, 9 and 20*** are rejected under 35 U.S.C. 103(a) as being unpatentable over Tanaka (5,177,753) in view Andrews (5,422,905) (previously made of record).

On claim 6: Tanaka teaches a semiconductor laser device (cf. title, abstract, Figure 6, col. 2, l. 28 – col. 3, l. 44, and col. 4, l. 15-40) including: a semiconductor laser chip 5 (cf. col. 2, l. 50) encapsulated within resin 15/18/20 (cf. col. 3, l. 15-18 for element 15, col. 3, l. 48-52 and col. 4, l. 59-66 for element 18, and col. 4, l. 44 for element 20) having a light diffusion capability by virtue of its constitution (cf. col. 3, l. 19-23) (quite apart from the at least two – component mixture that is comprised in said resin it is argued by the examiner that "a light diffusion capability" is inherent to any massive substance unless specifically quantified further) and forming a molded lens (namely through a curved face of the resin member (cf. col. 5, l. 3-12) of the molded resin 15; cf. col. 3, l. 19-44).

Tanaka does not necessarily teach the further limitation of the inclusion of at least one additional semiconductor laser chip.

However, it would have been obvious to include said further limitation because the utility of multiple beam laser diode chips has previously been amply recognized, as witnessed, for instance, by Andrews (cf. column 1, lines 13-36), who teaches two closely spaced and aligned semiconductor laser chips 22 and 24 (cf. column 3, line 34-60) providing parallel beams of light (cf. Figure 8).

The invention by Andrews has applicability inter alia to optical disk readers and multi-spot printers (cf. column 1, lines 13-36) and the incorporation of the teaching by Andrews in this regard in the invention by Tanaka is *motivated* by enlarging the

technology range to which said invention can be applied. *Combination* of said teaching with said inventions is easily accomplished by aligning another laser chip with the one already in place. *Success* in the implementation is thus *reasonable to expect*.

On claim 9: the further limitation as defined by claim 9 is inherent in the device of claim 6: with reference to the discussion of claim 7 as given above and incorporated herein by reference, spot size and radiation angle can be controlled through adjustment of the width of the light-emitting portion; and size, material, and dimension of the molded resin offers supplemental control through the scattering of the photons in said molded resin, whereby the spot size is increased whilst the direction of the light beam depends on the index of refraction, hence on the material constitution, of said molded resin. Therefore, the further limitation as defined by claim 9 does not distinguish over the prior art.

On claim 20: the two laser beams in Andrews are arranged in parallel (column 3, lines 31-42), which is necessary in the obvious application of optical disks as indicated by Andrews ("Background of Invention", column 1, lines 55-67) with one beam for reading and one beam for writing (they have to target the same spot for reading and writing).

8. ***Claim 11*** is rejected under 35 U.S.C. 103(a) as being unpatentable over Tanaka (5,177,753) in view of Okuda (6,049,423) (previously made of record). Tanaka anticipates claim 1 (on which claim 11 depends). Tanaka does not necessarily teach the further limitation as defined by claim 11, although Tanaka does teach a two-component

mixture for the materials (cf. col. 3, l. 19-23) with explicit mention of both epoxy resin and silica resin (cf. col. 3, l. 19-23). However, it would have been obvious to include said further limitation in view of Okuda because Okuda teaches that a mixture of transparent epoxy resin and silica resin, said resins having different refractive indices so as to bring about enhanced light diffusion, has long been practiced in the art of light-emitting devices: acrylic resin of index 1.53 with glass or silica resin of index 1.535 for the specific purpose of forming a light diffusion layer 16 (cf. column 4, lines 23-47).

Motivation to include the teaching by Okuda in this regard in the invention as essentially taught by Tanaka stems from the purpose as stated by Tanaka to achieve a smooth transparent resin face 15a (cf. col. 3, l. 15-23). *Combination* of said teaching with both inventions is easy: only the material constitution of the resin needs to be changed. *Success* in the implementation of said combination can therefore be *reasonably expected*.

Furthermore, the acrylic resin and the silica resin recited by Okuda merely constitute obvious examples of material selections that satisfy the criterion for the material constitution formulated by Tanaka. Applicant is reminded in this regard that it has been held that mere selection of known materials generally understood to be suitable to make a device, the selection of the particular material being on the basis of suitability for the intended use, would be entirely obvious. In re Leshin 125 USPQ 416.

9. ***Claims 12-13*** are rejected under 35 U.S.C. 103(a) as being unpatentable over Tanaka as applied to claim 1 above, and further in view of either Andrews (5,422,905)

and Brooks et al (6,049,125), or in view of Missaggia et al (IEEE Journal of Quantum Electronics 25 (9), pp. 1988-1992 (1989)) (previously made of record, copy provided). As detailed above, claim 1 is unpatentable over Tanaka. Tanaka does not necessarily teach the further limitation of claims 12-13. However, as evidenced by Andrews, it is well known in the art of semiconductor laser diode technology to contain the laser diode or diodes in a heat sink 38 (cf. column 3, lines 60-69) made of high thermal conductivity material such as copper, metallized beryllia (BeO), silicon, or diamond. In the case of copper the thermal conductivity is approximately 390 W / m.K. Therefore, the relevant length scale obtained by dividing the relevant surface area by the thickness of the copper that corresponds to the limit of 100 K/W for the thermal resistance as indicated by the further limitation of claim 13 is the common value of approximately 1 mil or greater for said relevant length scale. That this thickness range is in fact common is illustrated by Brooks et al who teach heat sink thicknesses in the range of between 5 and 10 mil (cf. column 3, lines 24-31), hence amply over 1 mil and certainly satisfying the weaker limitation of claim 12.

Motivation to include the teachings of Andrews and Brooks in this regard in the invention as anticipated by Tanaka stems from the improved heat conductance of the semiconductor laser device: thermal stress is inherently increased by the encapsulation in Tanaka, thus increasing the need for an effective heat sink. In the alternative, Missaggia et al teach a microchannel heat sink that contains a semiconductor diode laser array by virtue of the latter being bonded to it (cf. title and caption of Figure 1), with a value of 0.04 deg/W per unit area in square cm (cf. page 1990, second column). A 15

degree rise in temperature for a power of 80W (cf. page 1991, second column) is indicated, given the reported density of laser diodes in the array; which is below the upper limit in the further limitation of claim 12.

Motivation to include the teaching by Missagia et al in this regard in the invention as essentially taught by Nishino et al and Hirano et al stems from the improved heat extraction offered through the microchannel heat sink as invented by Missaggia et al. The teaching by Missagia et al can be easily *combined* with the device as essentially taught by Nishino et al and Hirano et al by planting the laser device on top of the heat sink plate of Missaggia et al as indicated in Figure 1 without any further impact on other aspects of the inventions. *Success* in implementing the combination can thus be *reasonably expected.*

Moreover, applicant fails to show in his disclosure that the range as indicated in claim 12 or the approximate value that is indicated in claim 13 (for the thermal resistance) is *critical to the invention.* Applicant is reminded that it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. In re Aller, 105 USPQ 233.

10. ***Claim 14*** is rejected under 35 U.S.C. 103(a) as being unpatentable over Tanaka and Claisse et al as applied to claim 4 above, and further in view of Hazell et al (IEEE Journal of Quantum Electronics <u>34</u> (12), pp. 2358-2363 (1998)) (previously made of record, copy provided). Although neither Tanaka nor Claisse et al necessarily mention

that the plurality of light-emitting portions of the same semiconductor laser chip emit light beams of the same wavelength, usually the multiple quantum wells generally are repeating units of single quantum wells and thus generally produce light of the same wavelength and hence can be used to produce monochromatic light, for evidenced, for instance, by Hazell et al, who teach a 1.3 micron multiple quantum well laser. As an obvious method to increase the total intensity of the desired monochromatic light all multiple quantum wells could thus be designed to produce light of the same wavelength.

Motivation for inclusion of the teaching by Hazell et al in this regard is the possibility to achieve higher overall intensity of the light of a desired wavelength. *Combination* of the teaching by Hazell et al with the device as essentially taught by Tanaka and Claisse et al can be easily achieved by employing repeating units of single quantum wells in the implementation of the teachings by Claisse et al, which would not impact on any other design consideration in said invention. *Success* of said combination can therefore be *reasonably expected.*

11. ***Claim 15*** is rejected under 35 U.S.C. 103(a) as being unpatentable over Tanaka and Andrews as applied to claim 6 above, and further in view of Hattori et al (5,012,478). As detailed above, claim 6 is unpatentable over Tanaka in view of Andrews. Neither Tanaka nor Andrews necessarily teach the further limitation as defined by claim 15. However, it would have been obvious to include said further limitation in view of Hattori et al, who, in the field of multiple beam lasers (column 1, lines 5-20), hence closely related to the field of Andrews as an obvious application of

the laser by Tanaka, teach the two lasers to have identical frequency (cf. abstract, second sentence), – hence inherently also identical wavelength because of the inverse proportionality of frequency and wavelength, for the specific purpose of avoiding the need to provide different optics for the two beams (column 1, lines 20-30). *Motivation* to include the teaching by Hattori et al in the invention by Tanaka and Andrews derives from the obvious field of application for the laser by Tanaka to the multiple beam semiconductor laser by Andrews, considering the savings achieved by eliminating the need for said different optics in order to prevent inter alia chromatic aberration (column 1, lines 20-55). Further motivation stems from the application of the device by Hattori to one high power beam for writing and one low power beam for reading in optical disk art (see column 5, line 67 – column 6, line 2), which is an application area specifically indicated by Andrews (cf. Andrews, column 1, lines 13-24). Coordination of the coatings on the facets as taught by Hattori (column 6, lines 27-48) so as to achieve the same wavelength for the beams is straightforwardly applicable to the device by Tanaka when applied as component in the device by Andrews, and hence combinability of the invention with Hattori's teaching is ensured.

12. ***Claim 17*** is rejected under 35 U.S.C. 103(a) as being unpatentable over Tanaka and Andrews as applied to claim 6 above, and further in view of Andrews (5,357,536), hence called "Andrews2". As detailed above, claim 6 is unpatentable over Tanaka in view of Andrews. Neither Tanaka nor Andrews necessarily teach the further limitation as defined by claim 17. However, it would have been obvious to include said further

limitation in view of Andrews2, who, in a patent drawn to a multi-beam semiconductor laser with aligned separate semiconductor chips 14 (column 4, lines 25 – 42) (Figure 1) with different wavelengths (column 3, lines 9-15), and with reference to applications also referred to at least generically by Andrews (columns 1 and 2) in which said wavelengths by design may be different (column 2, lines 10-68 and column 3, lines 1-8), thus making it difficult to manufacture the beam array monolithically (loc.cit.). *Motivation* to include the teaching by Andrews2 derives from the wider range of applicability of the invention, including multiple laser beam applications with different wavelengths for different beams, thus lifting an important constraint in applications.

13. ***Claims 18 and 19*** are rejected under 35 U.S.C. 103(a) as being unpatentable over Tanaka (5,177,753) in view of Marinace et al (3,614,550) and Koechner (ISBN 0-387-90167-1). As detailed above, Tanaka anticipates claim 1. Tanaka does not necessarily teach the further limitation as defined by claim 18 nor the one defined by claim 19. However, it would have been obvious to include said further limitation in view of Marinace, who teach in the art of encapsulated injection-type semiconductor laser devices (cf. title, abstract and col. 1, l. 5-20) (i.e., the same art as Tanaka) a GaAs diode laser chip 1 with GaAs semiconductor substrate 7 (col. 2, l. 35-62), encapsulated by resin 9 and emitting coherent electromagnetic radiation with a wavelength of 0.9 μm (col. 4, l. 43-45), hence "selected from a wavelength band of about 760 nm or more to about 1.5 μm or less", thus meeting <u>claim 18</u>, and which is moreover seen to be "selected from the vicinity of 900 nm" (=0.9 μm), thus meeting <u>claim 19</u>. Motivation to

include the teaching by Marinace et al to the invention by Tanaka derives from the fact that GaAs laser diodes provide the longest tested technology for the production of coherent radiation using semiconductor laser chips, as evidenced by W. Koechner, "Solid-State Laser Engineering", Springer Series in Optical Sciences, Springer Verlag, New York, Heidelberg, 1976, p. 277 ("Semiconductor Diodes") and Table 6.1 on page 246. The selection of the wavelength meeting claims 18 and is thus seen to be merely an obvious design choice.

Allowable Subject Matter

14. ***Claim 2*** is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. The following is a statement of reasons for the indication of allowable subject matter: strictly within the context of claim 1 with all its limitations as described in the current amendment, the prior art found to date, including Tanaka (5,177,753), does not teach that the semiconductor chip does not directly contact the resin.

15. ***Claim 3*** is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. The following is a statement of reasons for the indication of allowable subject matter: strictly within the context of claim 1 with all its limitations as described in the current amendment, the prior art found to date, including Tanaka (5,177,753), does not teach that the inclusion of a light diffusion plate between the semiconductor chip and the molded lens.

Conclusion

16. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL.** See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Johannes P Mondt whose telephone number is 571-272-1919. The examiner can normally be reached on 8:00 - 18:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nathan J Flynn can be reached on 571-272-1915. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

JPM
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